

REMARKS

Reconsideration of the application, as amended, is respectfully requested.

Claims 1-4, 7-8 and 11 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1-4, 7-8 and 11 of commonly owned co-pending U.S. Patent Application Serial No. 10/714,430.

Applicant respectfully disagrees with the above rejection. However, in the interest of advancing the prosecution of the subject application, a terminal disclaimer is attached. Accordingly, reconsideration and removal of the rejection is warranted.

Claim 12 was then rejected under 35 U.S.C. 112, second paragraph, as being indefinite on the grounds that it is unclear what the term "M" is required to be in the claim.

Applicant also disagrees with the foregoing rejection and maintains that the claim is definite in scope. However, in the interest of advancing the prosecution of the subject application, the terms suggested by the Examiner have been added to the claim. Accordingly, removal of this rejection is also warranted.

Lastly, the Examiner rejected claims 1-19 under 35 U.S.C. 103 as being unpatentable over U.S. Patent No. 5,972,424 to Draghi et al ("Draghi") in view of U.S. Patent No. 6,049,978 to Arnold ("Arnold") and U.S. Patent No. 6,074,706 to Beverly et al. ("Beverley").

The above rejection is respectfully disagreed with, and is traversed below.

The processing steps of Applicant's independent claims 1, 13 and 19 have been further clarified as supported by the specification at, for example, pages 9-12 and 14.

It is respectfully asserted that the Examiner's proposed combination of the cited references fails to teach or suggest all of the limitations recited in each of amended independent claims 1, 13 and 19. At the very least, this proposed combination fails to teach or suggest Applicant's particularly claimed weight measurement employed to restore adjacent airfoil to

airfoil throat distances without incurring a weight penalty, as explained in further detail below. Similarly, the Examiner's proposed combination also fails to teach or suggest Applicant's claimed feature "wherein the thermal barrier coating of d) is applied at a thickness greater than the thermal barrier coating a); and weight of the component having the bond coat of c) and the thermal barrier coating of d) thereon is denoted by w_5 , wherein w_5 is less than w_1 ."

As disclosed in the subject specification at pages 3-4, Applicants have determined that if conventional processes are used in the repair, the original or pre-repair coated airfoil section dimensions are not restored and thus blade to blade throat distances (distance between adjacent airfoil sections in an engine) increase. Applicants also have determined that such changes in airfoil dimension may substantially affect turbine efficiency. As further disclosed at page 6 of the specification and shown in Fig. 3, Applicants have determined how to compensate for base metal loss as a result of coating removal processes, and also restore airfoil section contour to its pre-repair or original coated airfoil contour dimensions, without a weight penalty. For instance, as disclosed at page 12, the weight/thickness margin remaining may be used to determine the thickness in which to apply the ceramic thermal barrier coating in order to restore the airfoil dimensions without suffering a weight penalty.

Advantageously, the newly coated component has the restored dimensions to meet the original aerodynamic intent of the part, as shown in Fig. 3 and does not suffer a weight penalty.

Thus, as also described at page 5 of the specification, an important advantage of embodiments of the invention is that resulting airfoil throat area restoration will allow the turbine to run much more efficiently. For example, during conventional repair of an engine run component, about 3 mils of underlying base metal thickness may be removed in the process. Thus, about a 3 mil loss of base metal may be experienced on both the pressure and suction side of an airfoil, which translates into about a 6 mil increase in throat dimension (distance between adjacent airfoil sections in an engine). While this increase in gap between the components may not adversely affect the mechanical operation of the engine, Applicants have determined that operation efficiency may be adversely affected. Embodiments of Applicants' invention present an innovative, much needed solution to the above problem, which is inexpensive to implement and does not require additional costly equipment.

Applicants respectfully assert that none of the cited references disclose or suggest the presently claimed method including all of the steps recited therein, whether viewed alone or in any combination. In particular, the primary reference, Draghi, is merely directed to the repair of a gas turbine engine component using a flash coating. According to Draghi, the part is inspected to “ensure that sufficient bond coat 12 remains to perform the repair ...” (Col. 4, lines 16-20). “If there is insufficient bond coat 12, the blade 18 may not be repaired with the method of [Draghi].” (Col. 4, lines 20-30).

In contrast, Applicants’ independent claims 1, 13 and 19 require “removing the thermal barrier coating system,” which includes a bond coat and a top ceramic coating. Thus, the method of Draghi teaches away from the present claims and one skilled in the art seeking to develop such a repair process would not even be motivated to look to Draghi for guidance nor even combine it with any other reference.

Moreover, although Draghi mentions at column 1, lines 44-46 that it is desirable to repair thermal barrier coated parts periodically to restore them to desirable conditions, Applicant points out that “desirable conditions” as used in Draghi does not equal restoration to prior airfoil dimensions as claimed by Applicants. As described above, this is a problem in the art solved by the presently claimed invention. In conventional repair processes, as described in Applicants’ specification, original dimensions are not restored as the thermal barrier coating is applied to its original specification/thickness, which has been carefully determined. After a number of repairs, however, the part may become too thin and thus not meet minimum design requirements. Applicants have solved the problem of how to particularly restore and maintain adjacent airfoil to airfoil throat distance while maintaining efficiency without a weight penalty. Draghi is not concerned with such a problem, and one skilled in the art would not be motivated to look to Draghi and then modify its teachings in an attempt to arrive at the present claims.

Draghi merely teaches at col. 1, lines 57-65, that a thinner wall is acceptable as long as it meets applicable inspection criteria. Thus, desirable conditions, according to Draghi, would include such a thinner component. Draghi does not conduct any measurements or perform any calculations to rebuilt and restore adjacent airfoil to airfoil throat dimensions to those

preceding an engine run to increase subsequent engine operation efficiency without a weight penalty. Nor does Draghi even restore the coated dimensions of the component as required by all of Applicants' claims. Draghi merely applies a flash coating in an attempt to increase the number of times a part can be repaired.

The addition of Arnold and/or Beverley does not cure the shortcomings of Draghi for at least the following reasons. Arnold is directed to a multi-step repair method where an "HVOF plasma spray material is applied so as to build up a cordal dimension of the engine part to a thickness greater than the thickness of an original cordal dimension of the engine part." (Col. 8, lines 37-40). This process is followed by sintering, hot isostatic pressing and finally "the engine part is machined, ground and/or polished to the original or desired dimensions." (Col. 8, lines 37-51). Applicants do not employ such an excess of coating as in Arnold that must be subsequently ground off and removed. To the contrary, Applicants' claimed invention advantageously employs particular weight determinations to restore adjacent airfoil to airfoil throat distance to about the distance preceding the engine run and thus does not use excess coating that must be subsequently removed.

Accordingly, Applicants assert that Arnold teaches away from the claimed invention. One skilled in the art seeking to develop the claimed invention would not even be motivated to look to Arnold for guidance nor even combine it with Draghi.

Lastly, Beverley discloses that surface features such as grooves are cast directly into the surface of a component yielding a nonplanar and interrupted interface between the component surface and ceramic layer. Beverley is not at all concerned with restoring airfoil to airfoil throat distances without a weight penalty as in the subject claims.

Applicants respectfully assert that there is no teaching, suggestion or motivation that would lead one of ordinary skill in the art to combine and then modify the teachings of the cited references in an attempt to arrive at the present claims. Without such a teaching or suggestion, the invention may only be considered obvious in hindsight, which is an improper basis for rejection.

For at least the reasons set forth above, independent claims 1, 13 and 19 should be found to

be allowable. In that these independent claims are in condition for allowance, then the remaining dependent claims should also be found to be allowable in view of their dependence from an allowable independent claim.

All issues raised by the Examiner having been addressed, the subject patent application is believed to be in condition for immediate allowance. No new issues are raised that would require an additional search. Accordingly, the Examiner is respectfully requested to enter and consider the subject Amendment, and remove all of the outstanding rejections. A Notice of Allowance is therefore respectfully requested.

According to currently recommended Patent Office policy, the Examiner is requested to contact the undersigned at the telephone number provided below in the event that a telephone discussion will advance the prosecution of this application. An early and favorable action is earnestly solicited.

No fees are believed due with this amendment. However, should the undersigned attorney be mistaken regarding whether any fees are due, then please adjust deposit account no.: 50-1924, accordingly.

Respectfully submitted,

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